

Date and G.M.T. 1909.	R.A. 1909°0.			Log Parallax Factor.	Dec. 1909°0.		Log Parallax Factor.	Correction for Earth's Aberration.	
								R.A. s	Dec. "
	d	h	m s	h	m s	°	' "		
334. Chicago.									
Nov. 30	11	54	35	4 29	58'94	+7'221	+16 4 48'4	+0'704	+1'41 3'1
Dec. 1	9	45	6	4 29	20'30	-9'293	16 3 40'5	0'723	1'41 3'1
	3	9	32 56	4 27	55'41	-9'302	16 1 19'8	0'724	1'40 3'1
	8	11	2 27	4 24	22'17	-8'299	15 55 57'5	0'706	1'39 3'0
50. Virginia.									
Nov. 30	11	54	35	4 30	39'91	+7'222	+16 42 26'0	+0'698	+1'41 3'1
Dec. 1	9	45	6	4 29	46'10	-9'294	16 40 19'2	0'717	1'41 3'1
	3	9	32 56	4 27	48'83	-9'303	16 35 57'1	0'719	1'40 3'1
	8	11	2 27	4 23	1'37	-8'301	16 26 13'8	0'701	1'39 3'0

Royal Observatory, Greenwich:
1910 November 4.

Mean Areas and Heliographic Latitudes of Sun-spots in the Years 1907, 1908, and 1909.

(Communicated by the Astronomer Royal.)

The results here given are in continuation of those printed in the *Monthly Notices*, vol. lxx. p. 76, and are deduced from the measurements of photographs taken at the Royal Observatory, Greenwich; at Dehra Dûn; at the Kodaikânal Observatory, India; and at the Royal Alfred Observatory, Mauritius.

Table I. gives the mean daily area of umbræ, whole spots, and faculæ for each synodic rotation of the Sun in the three years 1907, 1908, and 1909; and Table II. gives the same particulars for each of the entire years 1901 to 1909 inclusive. The areas are given in two forms: first, projected areas, that is to say, as seen and measured on the photographs, these being expressed as millionths of the Sun's apparent disc; and next, areas as corrected for foreshortening, the areas in this case being expressed in millionths of the Sun's visible hemisphere.

Table III. exhibits for each rotation in the three years 1907 to 1909 the mean daily area of the whole spots (corrected for foreshortening), and the mean heliographic latitude of the spotted areas for spots north and for spots south of the equator, together with the mean heliographic latitude of the entire spotted area, and the mean distance from the equator of all spots; and Table IV. gives

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the same information for each year as a whole for the years 1901 to 1909 inclusive. Table II. and IV. are thus in continuation of the similar tables for the years 1874 to 1888 on pp. 381 and 382 of vol. xlix. of the *Monthly Notices*, and for the years 1889 to 1902 on pp. 465 and 466 of vol. lxiii., and for the years 1901 to 1906 on pp. 77 and 78 of vol. lxx.

The rotations in Table I. and Table III. are numbered in continuation of Carrington's series (*Observations of Solar Spots made at Redhill*, by R. C. Carrington, F.R.S.), No. I. being the rotation commencing 1853 November 9. The assumed prime meridian is that which passed through the ascending node at mean noon of 1854 January 1, and the assumed period of the Sun's sidereal rotation is 25·38 days. The dates of the commencement of the rotations are given in Greenwich civil time, reckoning from mean midnight.

TABLE I.

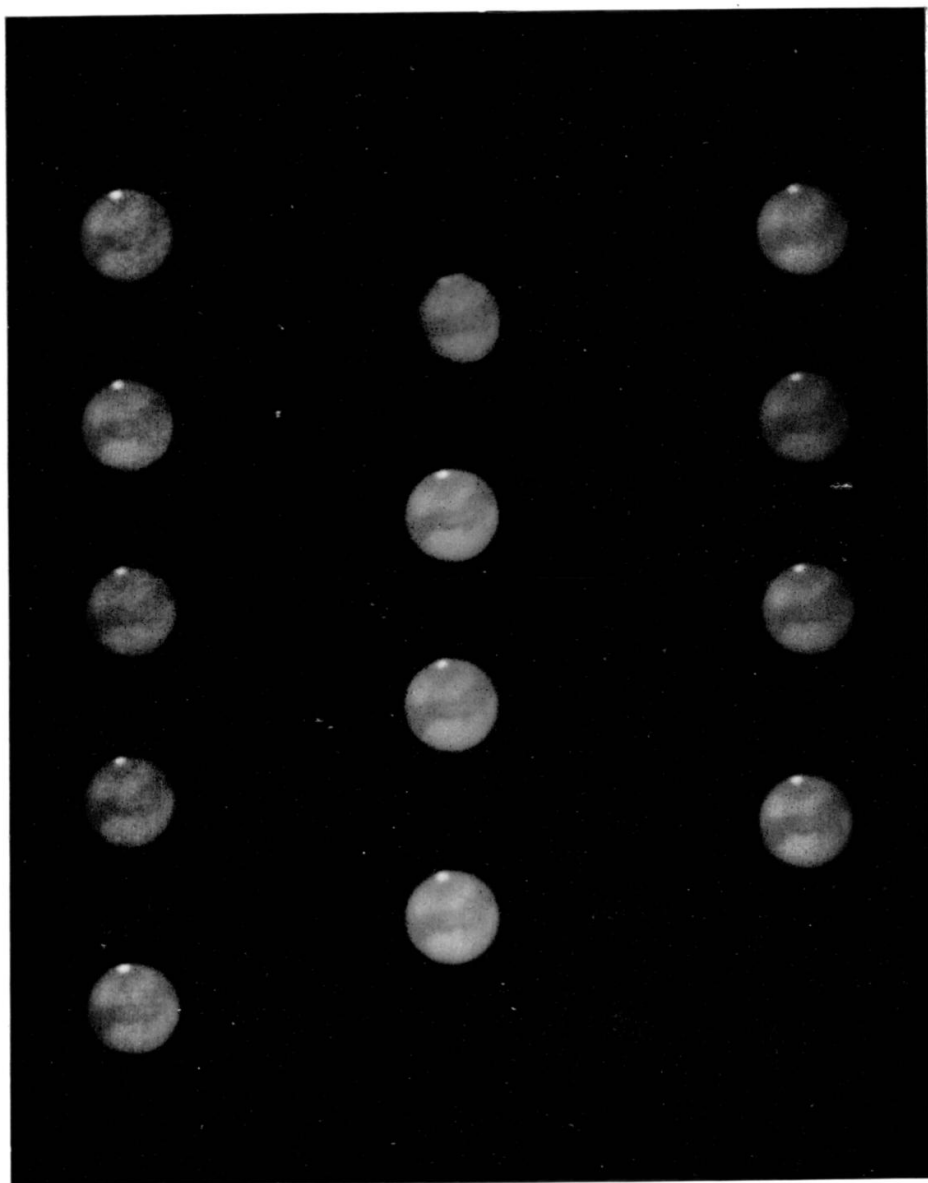
No. of Rotation.	Date of Commencement of each Rotation.	No. of Days on which Photographs were taken.	Mean of Daily Areas.					
			Projected.			Corrected for Fore-shortening.		
			Umbrae.	Whole Spots.	Faculae.	Umbrae.	Whole Spots.	Faculae.
	1906. d							
712	Dec. 15·64	27	297	1913	2072	222	1493	2334
	1907.							
713	Jan. 11·97	27	312	2040	2434	221	1465	2515
714	Feb. 8·32	28	490	3034	2416	349	2236	2600
715	Mar. 7·65	27	151	980	2250	106	710	2432
716	Apr. 3·95	27	134	882	1850	93	628	1970
717	May 1·21	28	139	886	1418	97	655	1536
718	May 28·43	27	199	1398	1303	145	1014	1419
719	June 24·63	27	163	1062	1459	119	820	1548
720	July 21·84	27	114	818	1314	95	697	1424
721	Aug. 18·06	27	201	1456	1514	141	1080	1688
722	Sept. 14·31	27	222	1493	2245	166	1169	2407
723	Oct 11·59	28	259	1708	1812	195	1263	1960
724	Nov. 7·89	27	248	1513	2083	180	1132	2191
725	Dec. 5·20	28	224	1492	2007	154	1069	2156
	1908.							
726	Jan. 1·53	27	110	708	2305	80	545	2422
727	Jan. 28·87	28	49	295	2348	36	225	2477
728	Feb. 25·21	27	57	391	1851	43	305	1973
729	Mar. 23·53	27	121	843	1860	82	587	1935
730	Apr. 19·80	27	99	703	1696	78	573	1834
731	May 17·04	28	145	1057	1685	96	713	1755
732	June 13·24	27	63	433	1665	47	319	1714
733	July 10·44	27	167	1093	2015	110	734	2093

TABLE I.—*continued.*

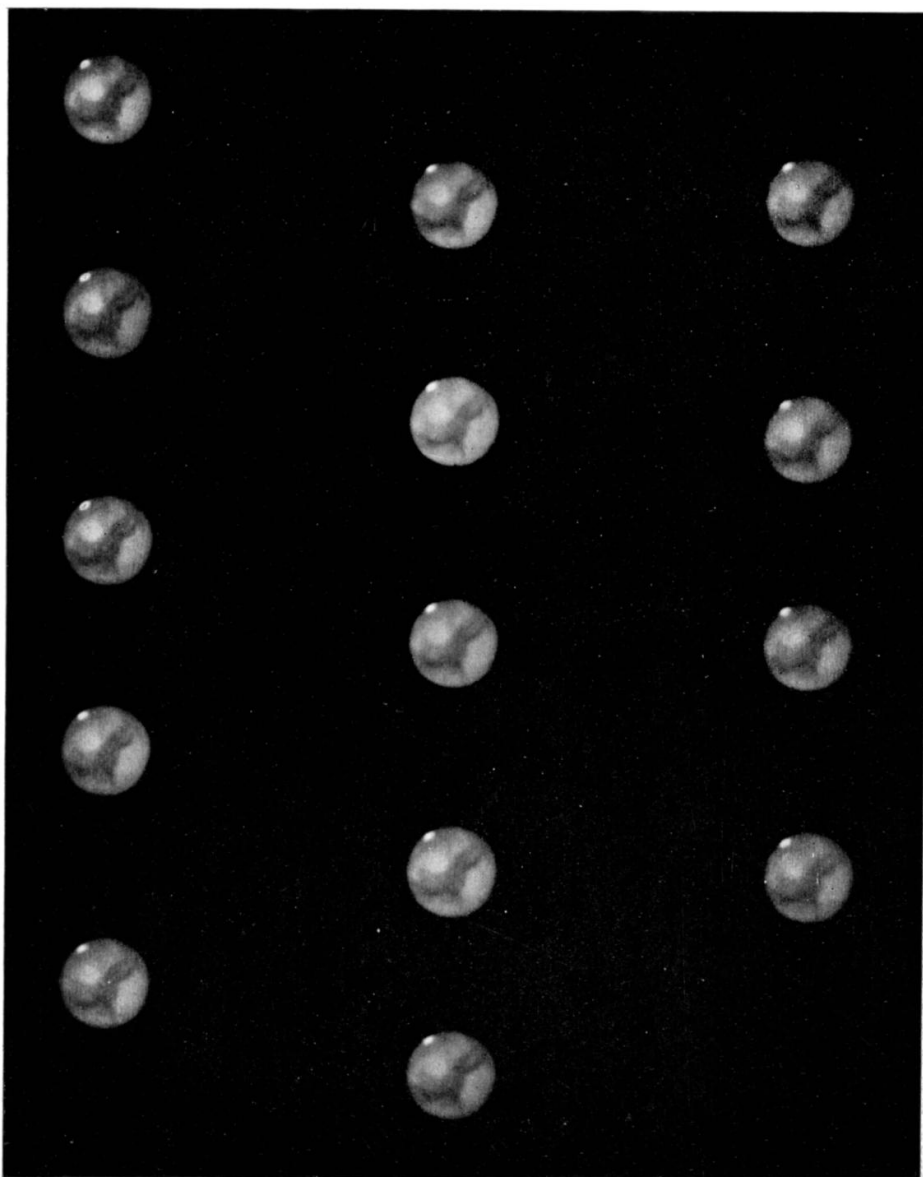
No. of Rotation.	Date of Commencement of each Rotation.	No. of Days on which Photographs were taken.	Mean of Daily Areas.					
			Projected.			Corrected for Fore-shortening.		
			Umbrae.	Whole Spots.	Faculae.	Umbrae.	Whole Spots.	Faculae.
	1908. d							
734	Aug. 6.65	27	354	2395	2174	258	1780	2320
735	Sept. 2.90	27	360	2210	2271	262	1614	2456
736	Sept. 30.17	28	91	573	2670	69	444	2750
737	Oct. 27.46	27	189	1123	1950	125	749	1990
738	Nov. 23.76	27	113	588	1697	88	449	1721
739	Dec. 21.09	27	205	1123	1410	151	862	1528
	1909.							
740	Jan. 17.42	28	264	1536	1495	186	1095	1561
741	Feb. 13.76	27	236	1348	1953	169	1004	1977
742	Mar. 13.09	27	223	1365	1738	152	944	1821
743	Apr. 9.39	28	72	452	1400	53	329	1427
744	May 6.64	27	150	709	1250	107	514	1271
745	June 2.85	27	70	399	948	54	307	1026
746	June 30.05	28	140	813	1280	93	546	1322
747	July 27.25	25	57	289	1149	42	225	1221
748	Aug. 23.48	28	106	537	976	96	485	1025
749	Sept. 19.74	27	303	1547	1317	221	1170	1382
750	Oct. 17.03	28	122	655	1073	100	545	1128
751	Nov. 13.33	27	240	1263	1237	164	889	1278
752	Dec. 10.64	27	235	1213	1078	167	865	1086

TABLE II.

Year.	No. of Days on which Photographs were taken.	Mean of Daily Areas.					
		Projected.			Corrected for Foreshortening.		
		Umbrae.	Whole Spots.	Faculae.	Umbrae.	Whole Spots.	Faculae.
1901	359	14	41	23	9	29	29
1902	349	14	86	163	10	62	178
1903	350	67	434	875	51	340	970
1904	363	93	653	1639	67	488	1761
1905	364	230	1637	2433	163	1191	2612
1906	364	158	1047	2207	114	778	2320
1907	365	221	1453	1859	160	1082	1999
1908	366	148	952	2000	106	697	2098
1909	364	171	941	1302	124	692	1354



MARS, 1909 SEPTEMBER 24. 16H. 55M. G.M.T.—E. E. BARNARD.



MARS, 1909 SEPTEMBER 28. 16H. 46M. G.M.T.—E. E. BARNARD.

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TABLE III.

No. of Rotation.	Date of Commencement of each Rotation.	No. of Days on which Photographs were taken.	Spots NORTH of the Equator.		Spots SOUTH of the Equator.		Mean Helio-graphic Latitude of entire Spotted Area.	Mean Distance from Equator of all Spots.
			Mean of Daily Areas.	Mean Helio-graphic Latitude.	Mean of Daily Areas.	Mean Helio-graphic Latitude.		
712	1906. d Dec. 15·64	27	1034	11°13	459	15°85	+ 2°84	12°58
713	1907. Jan. 11·97	27	832	14·81	632	14·62	+ 2·11	14·73
714	Feb. 8·32	28	555	12·24	1682	14·45	- 7·83	13·90
715	Mar. 7·65	27	266	11·10	444	15·00	- 5·21	13·54
716	Apr. 3·95	27	432	11·29	196	11·81	+ 4·08	11·45
717	May 1·21	28	171	5·84	484	11·69	- 7·12	10·17
718	28·43	27	50	10·99	963	14·58	- 13·31	14·40
719	June 24·63	27	186	4·18	634	10·08	- 6·84	8·74
720	July 21·84	27	236	9·21	461	14·71	- 6·62	12·85
721	Aug. 18·06	27	603	9·12	478	15·50	- 1·77	11·94
722	Sept. 14·31	27	656	7·84	513	13·82	- 1·67	10·47
723	Oct. 11·59	28	743	7·88	520	16·64	- 2·21	11·49
724	Nov. 7·89	27	937	10·91	195	11·91	+ 6·98	11·08
725	Dec. 5·20	28	504	10·49	565	10·28	- 0·49	10·38
726	1908. Jan. 1·53	27	216	11·14	329	7·83	- 0·31	9·14
727	28·87	28	128	16·98	97	12·05	+ 4·45	14·85
728	Feb. 25·21	27	41	9·61	264	8·16	- 5·77	8·35
729	Mar. 23·53	27	34	10·92	553	12·05	- 10·71	11·99
730	Apr. 19·80	27	126	11·24	446	11·31	- 6·34	11·30
731	May 17·04	28	166	10·80	547	8·14	- 3·73	8·76
732	June 13·24	27	87	10·08	232	12·88	- 6·64	12·12
733	July 10·44	27	263	11·53	471	14·51	- 5·17	13·44
734	Aug. 6·65	27	785	8·20	995	10·89	- 2·47	9·70
735	Sept. 2·90	27	993	9·97	621	7·42	+ 3·28	8·99
736	30·17	28	220	10·36	224	8·31	+ 0·94	9·32
737	Oct. 27·46	27	659	11·27	90	11·48	+ 8·55	11·30
738	Nov. 23·76	27	352	11·62	96	13·51	+ 6·22	12·02
739	Dec. 21·09	27	637	9·69	226	9·95	+ 4·55	9·76
740	1909. Jan. 17·42	28	615	8·61	480	10·21	+ 0·36	9·31
741	Feb. 13·76	27	412	8·53	592	10·26	- 2·55	9·55
742	Mar. 13·09	27	587	10·43	357	11·35	+ 2·20	10·77
743	Apr. 9·39	28	110	8·22	220	9·52	- 3·61	9·09
744	May 6·64	27	63	9·92	451	16·19.	- 13·01	15·42

TABLE III.—*continued.*

No. of Rotation.	Date of Commencement of each Rotation.	No. of Days on which Photographs were taken.	Spots NORTH of the Equator.		Spots SOUTH of the Equator.		Mean Heliographic Latitude of entire Spotted Area.	Mean Distance from Equator of all Spots.
			Mean of Daily Areas.	Mean Heliographic Latitude.	Mean of Daily Areas.	Mean Heliographic Latitude.		
	1909. d			°		°		°
745	June 2·85	27	29	6·98	278	8·86	— 7·36	8·68
746	30·05	28	479	7·67	68	4·15	— 6·20	7·23
747	July 27·25	25	140	9·17	85	15·34	— 0·09	11·50
748	Aug. 23·48	28	37	12·36	448	6·25	— 4·84	6·71
749	Sept. 19·74	27	116	9·80	1054	6·63	— 5·00	6·95
750	Oct. 17·03	28	200	6·16	346	9·29	— 3·63	8·14
751	Nov. 13·33	27	402	12·71	488	11·41	— 0·52	12·00
752	Dec. 10·64	27	443	9·81	422	14·12	— 1·86	11·91

TABLE IV.

Year.	No. of Days on which Photographs were taken.	Spots NORTH of the Equator.		Spots SOUTH of the Equator.		Mean Heliographic Latitude of entire Spotted Area.	Mean Distance from Equator of all Spots.
		Mean of Daily Areas.	Mean Heliographic Latitude.	Mean of Daily Areas.	Mean Heliographic Latitude.		
1901	359	22	8·59	7	16·27	+ 2·82	10·37
1902	349	42	18·81	21	15·29	+ 7·48	17·64
1903	350	132	18·11	208	21·15	— 5·85	19·94
1904	363	268	16·33	220	16·88	+ 1·37	16·57
1905	364	750	11·66	440	15·55	+ 1·60	13·10
1906	364	539	13·98	239	14·01	+ 5·38	13·99
1907	365	488	10·12	593	13·77	— 2·98	12·12
1908	366	316	10·42	381	10·34	— 0·92	10·38
1909	364	299	9·45	393	9·92	— 1·55	9·71

The principal features of the record for the three years 1907, 1908, and 1909 are—

1. A great increase in the mean daily spotted area for 1907 as compared with 1906; indeed the level of 1905 was almost reached, the umbræ showing 98 per cent., the whole spots 91 per cent. of the areas shown in that year. So strongly marked a revival following a decrease so considerable as that shown by 1906 is quite exceptional; the curve at maximum of the present cycle shows therefore two well-defined peaks, separated by a deep depression. In 1908 the mean daily spotted area dropped a little below the level of 1906, but this downward tendency was checked in 1909, which gave an area for whole spots about equal to that of 1908, and for umbræ a

slight increase. From this check in the decline, following on the remarkable second maximum given by 1907, the apex of the final smoothed curve will probably fall early in 1907, or thirteen years and a half later than the apex of the curve in the preceding cycle. The period, therefore, on this occasion exceeds the average by more than two years.

2. An examination of the results for the separate rotations shows that the highest value during the entire maximum was obtained for the mean daily spotted area in rotation 714, commencing 1907 February 8. This closed a short period of special activity that had prevailed during the winter of 1906-7. For the greater part of 1907 a fair amount of activity was maintained, rising to a higher level during the autumn, and diminishing sharply during the winter. The following year, 1908, opened quietly, but a striking though short-lived revival marked the months of August and September, rotation 734 giving a mean area exceeded only four times during the present maximum, *i.e.* three times in 1905 and once in 1907. A decline followed during the autumn, succeeded by a moderate revival in the winter. In 1909, as in 1907, the spring and summer were relatively quiet, and were followed by a revival of activity as the year advanced; but though the mean daily area for the year as a whole was practically the same for 1909 as for 1908, the facts that the fluctuations in activity were not quite so great, nor the periods of the minor undulations of the curve quite so long, indicate that the minimum phase of the curve is approaching.

3. The curve shown by the areas of the faculæ displayed some marked differences from that given by the sun-spots. First, of all, it has been, as usual, the smoother of the two curves; and next, its crest was reached in 1905, and its downward progress since that date has been, on the whole, fairly regular. Third, the check in this decline was felt by the faculæ a full year earlier than with the spots; for whilst with the spots 1908 and 1909 were nearly equal in area, and were both much inferior to 1907, with the faculæ 1908 rose above the level of 1907, but 1909 fell far below 1908.

4. Comparing the whole spots of the two hemispheres, the southern hemisphere has tended in general to be slightly but distinctly more prolific than the northern during each of the three years 1907, 1908, and 1909. The oscillations in preponderance from the one hemisphere to the other have been frequent, but on the whole the northern spotted area for 1907 and 1908 has been to the southern as 45 to 55; for 1909 it has been as 43 to 57. In the two preceding cycles the balance had turned heavily in favour of the southern hemisphere by the time that the maximum had been reached, and it remained generally in the same sense during the whole period of the decline.

5. The mean distance from the equator of all spots has shown a steady decrease from 1906 to the end of 1909, and would appear to indicate that about three more years will bring the period of minimum.

6. The Sun was free from spots on one day in 1907, on six days in 1908, and on five in 1909, as against five days in 1906 and two in 1905.

7. The distribution of spots in latitude during the three years has been very characteristic of the declining phase of the cycle. In the northern hemisphere no spots were seen in higher latitudes than $+27^\circ$ in 1907 and 1908, or than $+18^\circ$ in 1909. The decline in the southern hemisphere has not been quite so pronounced, for spots attained a latitude of -29° in 1907, of -25° in 1908, and -24° in 1909. In both hemispheres the disturbed zones extended downwards to the equator.

8. The number of separate groups of spots diminished steadily during the three years. In 1906 it was 351; in 1907, 329; in 1908, 304; and in 1909, 237. As the mean daily spotted area for 1909 was practically the same as in 1908, the falling off in the number of separate groups involved an increase in the average size of the group. This was due to a marked diminution in the number recorded of very small and very short-lived groups.

9. Of the 329 separate groups in 1907, 151 were in the northern hemisphere and 178 in the southern. The 304 groups of 1908 were divided into 129 north and 175 south, and the 237 of 1909 into 95 north and 142 south. Expressed in percentages, the proportion in 1907 was 46 north to 54 south; in 1908, 42 north to 58 south; and in 1909, 40 north to 60 south,—the preponderance of the southern hemisphere therefore steadily increasing as time went on.

Royal Observatory, Greenwich :
1910 November 3.

Note on Tycho Brahe's opinion about the Solar Parallax.

By J. L. E. Dreyer. (Plate 4.)

From the time of Ptolemy to that of Kepler no serious attempt was made to improve on the value of the solar parallax adopted by Ptolemy, viz. $2' 51''$. Mercury and Venus, being supposed to move in orbits smaller than the solar orbit, ought to have exhibited parallaxes well within the range of the instruments of the Middle Ages, especially Mercury, which at inferior conjunction ought to have had a parallax equal to that of the Moon at apogee, or $54'$. It may possibly have been this circumstance which induced Ibn Iûnis to reduce the solar parallax from $3'$ to $2'$, or rather to $1' 57''$, though he does not give any reason for doing so. Geber blamed Ptolemy for having said that the parallaxes of the planets are insensible, and remarked that in that case he ought to have placed Venus and Mercury above the Sun.* Copernicus made no

* Tycho ought to have known this remark of Geber's, as it occurs in his book, translated by Gherardo of Cremona, and published at Nürnberg in 1534 with Apian's *Instrumentum primi mobilis* (introd., p. 3, and lib. vii. p. 104).

NB ego loquor de transitu &
 de meridiano una cum ducti
 rursus in fine & in com
 ductus supra 90 gradus
 quod reuertitur quasi per 20.
 & Utriusque rursus & ductus
 non correspondens minutis
 in ab uno meridiano in altero
 in ut parallax in probris
 infimabilibus | cum tunc supra
 parallaxem Apparentem ducam no
 omnes quasi & pars & Caput
 1/3 pars sine parallaxe obliqua
 Examinare

NOTE BY TYCHO BRAHE ON THE PARALLAX OF VENUS, 1590.